Alternatives Evaluation

Executive Summary

Seward & 36th IMPROVEMENTS

Prepared for:

Alaska Department of Transportation
and Public Facilities
P.O. Box 196900
Anchorage, AK 99519-6900

Prepared by:

HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, AK 99503

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Appendices

1.0 INTRODUCTION

This document summarizes the decision process used to select an alternative for improvements to the New Seward Highway and 36th Avenue Intersection. It consists of an executive summary, a decision matrix, and various white papers discussing issues studied.

In early fall of 2012 HDR was given the notice to proceed to prepare a preliminary design and environmental document for the "Midtown Congestion Relief" project. The scope was to study traffic congestion on the New Seward Highway from Tudor Road to Chester Creek. Because of budget constraints, the Department determined the project focus would be modified to include only the intersection of the New Seward Highway and 36th Avenue rather than actively study the entire corridor. In early 2013 the team changed focus to the New Seward Highway and 36th Avenue intersection as a stand-alone project. Goals were developed for the project based on the project Purpose and Need statement in the environmental check list document and the probable funding level. The project goals are identified as:

- Improve traffic flow in Midtown and on the New Seward Highway
- Shorten travel times to and from Midtown and U-Med
- Improve safety by reducing crash rates
- Improve safety and travel for pedestrians and bicycles
- Consistency with the Anchorage 2035 Metropolitan Transportation Plan (MTP)

Conventional interchanges will not fit at 36th Avenue because of the proximity of Benson and Northern Lights Boulevard to the north and Tudor Road to the south. There is less than half-mile spacing between Benson and 36th and between 36th and Tudor which is less than half the separation distance recommended by AASHTO between interchanges to safely and efficiently accomplishes traffic weaving. The model of a traditional interchange with only the half-mile separation is expected to result in an unacceptable impact to traffic operations and safety. This required the team to look at non-standard types of interchanges. In addition to other ideas, one of the solutions to solve the weave problem is to modify more conventional interchange types by placing ramps on the interior (between the northbound and southbound lanes) as shown in the diagrams. These interior ramp alternatives are designated as "hybrid alternatives".

During the spring of 2013 five design alternatives were developed. These alternatives were presented to, and discussed with, ADOT and MOA staff at a Design Charrette held on June 19, 2013, and later at a meeting with local business owners held at HDR on October 1, 2013 and a public meeting held at the Loussac Library on October 2, 2013.

Based on input from those meetings, the project team made revisions and developed additional alternatives to address issues that were raised, such as safety concerns related to pedestrians and bicyclists. These options included various ramp modifications, and a loop ramp alternative that emphasizes connectivity from 36th Avenue to and from the south.

2.0 METHODOLOGY

To adequately study the intersection enhancement, it was necessary to consider the possible future configuration of the corridor. HDR did this by benchmarking the Anchorage 2035 MTP and previous highway studies. The goal was to ensure that improvements at 36th Avenue were

compatible with the reasonable future alternatives in the Seward Highway corridor to the north as well as the new Tudor Road configuration.

The team used a Pugh Matrix to determine the relative merits of the alternatives (see Appendix A). The Pugh Matrix is a widely recognized tool for engineering alternatives selection. The matrix accomplishes this comparison by rating each alternative on the merits of the following 12 criteria:

- Capital Cost
- Impact to Private Property
- Traffic Operations
- Facility Maintenance
- Pedestrians and Bicycles
- Maintenance of Traffic
- Functional Life
- Driver Expectancy
- Environmental Impacts
- Safety
- Long Range Plan
- Community and Government Expectations

Each of these criteria has been assigned a weight to reflect its importance to the project. For each alternative the rating is multiplied by the weight for each criterion and the products are summed to give the total score for that alternative.

The criteria selection and scoring for each alternative was driven by the project Purpose and Need statement and the Project Goals, which place the emphasis on the Traffic Operations and the Safety categories. The Capital Cost and Functional Life categories follow closely in value. The Decision Matrix and its component parts are described more fully in Appendix A.

The project team looked at both at-grade and grade-separated alternatives. These alternatives included a conventional Single Point Urban Interchange (SPUI), Hybrid SPUI (hSPUI), Hybrid Diverging Diamond Interchange (hDDI), Grade-Separation, and Continuous Flow Intersection (CFI). Later a Hybrid SPUI without on-Ramps, a Partial Diamond Interchange, a Split Diamond Interchange, and a Loop Ramp Interchange that connected 36th avenue to the New Seward Highway to/from the south were added to the Decision Matrix.

A Ramp Need Analysis was performed based on the following concerns:

- The close proximity between 36th avenue and adjacent interchanges/intersections presents significant challenges to traffic flow;
- The cost of building braided ramps is prohibitive; and
- Concerns with the operation of interior ramps.

The Hybrid SPUI alternative was used as a base concept with the assumption that the analysis would apply similarly to any of the alternatives.

A white paper was prepared to document the results of this analysis titled "Ramp Need Analysis" (Appendix B). The analysis shows that removing the northbound on-ramp has little effect on the overall operations in the system, while removing the southbound on-ramp would induce an unacceptable increase in system delay.

In addition to the options shown in the Decision Matrix, various other alternatives were analyzed. To clarify the options that were looked at, two additional reference sections are shown in Appendix A. One is the "Options Carried Forward" and the other is "Options Considered, Not Carried Forward". A "stick figure" diagram is included along with a brief summary why each option was either carries forward for further study or dismissed.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The Decision Matrix indicates that the Hybrid SPUI alternative best satisfies the Purpose and Need Statement and Project Goals. The Half SPUI with CD roads scores similarly and appears to be an acceptable alternative. As a result of the closeness in final scoring of both alternatives, further refinement of these two alternatives and additional input from the public and government officials will assist in making a final determination.

A concern with the Hybrid SPUI is the unconventional nature of interior ramps. Motorists on the New Seward Highway may not expect a left-handed departure, or be prepared for traffic merging from the left. The project team discussed potential solutions to address that concern with HDR and ADOT Traffic Engineers. The following elements can be incorporated to address those concerns:

- A northbound on-ramp may not be initially constructed. The northbound on-ramp is not required for operation purposes based on the Ramp Need Analysis in the near term.
- A parallel on-ramp, rather than the typical taper on-ramp, will be constructed on the southbound New Seward Highway. Traffic will have an opportunity to accelerate to within 5 mph of the highway design speed before merging.
- Gores will be overlapped to prevent traffic from entering the New Seward Highway at 36th Avenue to exit at Tudor Road, or entering from Tudor Road and trying to exit at 36th Avenue.

Appendix A

Decision Matrix

HDR			Memo
To:	Sean Holland, AKDOT&PF Project Manager		
From:	Paul Witt, HDR Project Manager	Project: Seward Highway & 36th Ave. Preliminary Design	
CC:	Chris Melander, Mike Tooley HDR		
Date:	March 28, 2014		

RE: Seward Highway & 36th Avenue Interchange Alternatives Decision Matrix

The decision matrix was prepared to quantitatively analyze the alternatives currently under consideration for the Midtown Congestion Relief project. The matrix compares twelve intersection/interchange alternatives: ***Hybrid Single Point Urban Interchange (hSPUI), Half SPUI with Collector Distributor(CD) Roads, Loop Ramp Interchange, Half SPUI with Braided Ramps, Conventional Single Point Urban Interchange (SPUI), Hybrid Diverging Diamond Interchange (hDDI), Split Diamond Interchange, Grade Separation, Partial Diamond Interchange, Continuous Flow Intersection (CFI), Hybrid SPUI without On-Ramps, and a No Build Condition.***

The Pugh Matrix or Pugh Method was adopted for this exercise and is a widely recognized tool for engineering alternatives selection. The matrix accomplishes this comparison by rating each alternative on the merits of the following 12 criteria; ***Capital Cost, Impact to Private Property, Traffic Operations, Facility Maintenance, Pedestrians & Bicycles, Maintenance of Traffic, Functional Life, Driver Expectancy, Environmental Impacts, Safety, Long Range Plan, and Community and Government Expectations***. Each of these criteria has been assigned a weight out of 12 possible points to reflect its importance within the project. For each alternative the rating is multiplied by the weight for each criterion and the products are summed to give the total score for that alternative.

The Criteria selection and scoring for each alternative is driven by the project Purpose and Need statement which places particular emphasis on Traffic Operations and Safety. These criteria were assigned weights 2.0 or greater to stress their importance in the selection process. The remaining criteria are also important in rating the alternatives but are not considered to be within the core of the Purpose and Need for this project. For this reason some of the criteria were assigned lower weights.

The rating scale selected ranges from -2 to +2, where 0 represents the existing conditions (no build alternative) at the intersection, positive values represent improvement or benefit, and negative values indicate a deterioration or drawback in the selected criteria. The no-build alternative is set as the baseline and was not specifically evaluated in the matrix. The no-build alternative will not meet the Purpose and Need for the project. Without improvements, the Level of Service at Seward Highway and 36th Avenue, and surrounding intersections, will continue to deteriorate as traffic volumes increase.

Brief narratives have also been prepared and included as attachments to support the ratings given within the decision matrix. Figures of each alternative have also been included.

The goal of the decision matrix is to address all of the critical factors that go into selecting the preferred alternative. During the course of the Design Charrette the concept arose to remove ramps or otherwise modify the interchange to something other than providing access at each quadrant. In order to make the selection process as clear as possible, variants of the 12 alternatives were not included. The variants have similar impacts on each of the alternatives and would not affect the final selection. Variants will be explored in greater detail during the preliminary design phase; however, traffic models indicate that anything less than an interchange would exacerbate the failing condition at Benson Boulevard and Northern Lights Boulevard and cause a failed condition at Tudor.

As a result of scoring each alternative within this decision matrix, **HDR recommends the Hybrid Single Point Urban Interchange (SPUI) as the preferred alternative**. This alternative received the best overall score with high ratings in key criteria such as Capital Cost, Traffic Operations and Functional Life.

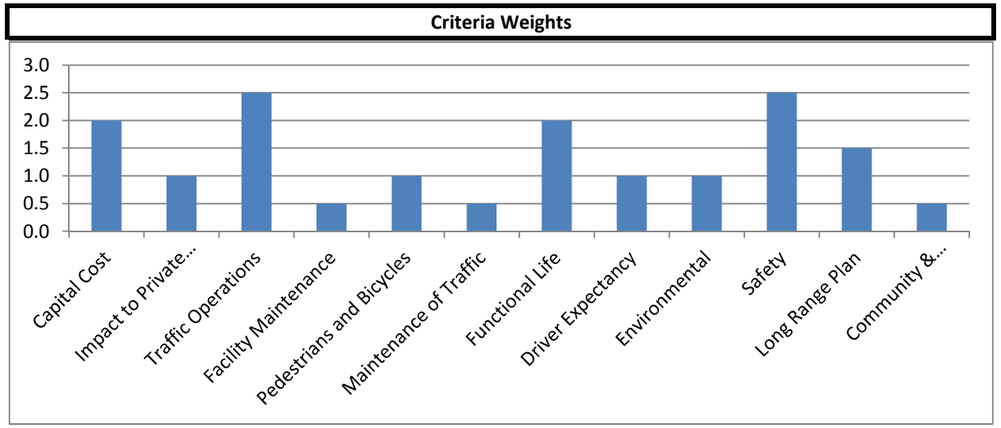
HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, Alaska 99503-2632

Phone (907) 644-2000
Fax (907) 644-2022
www.hdrinc.com

New Seward Highway and 36th Avenue Interchange - Decision Matrix Summary

Criteria and Weight		Capital Cost 2.0	Impact to Private Property 1	Traffic Operations 2.5	Facility Maintenance 0.5	Pedestrians and Bicycles 1	Maintenance of Traffic 0.5	Functional Life 2	Driver Expectancy 1	Environmental 1	Safety 2.5	Long Range Plan 1.5	Community & Government Expectations 0.5
Alternative and Total Score		Total Score = Σ (Criteria Rating X Criteria Weight)											
Hybrid Single Point Urban Interchange (hSPUI)	**8.6**	-1.50	-1.00	1.75	-0.50	1.00	-1.00	1.75	-0.50	-0.50	1.00	1.50	1.50
Half SPUI w/CD Roads (PH 1 of 2)	**8.0**	-1.50	-1.00	1.75	-0.50	1.50	-1.25	1.50	-0.50	-1.00	1.50	1.00	0.50
Loop Ramp Interchange	**5.3**	-1.50	-2.00	1.50	-0.50	0.75	-1.00	1.50	0.00	-0.75	1.00	1.00	0.50
Half SPUI w/Braided Ramps (PH 2 of 2)	**5.0**	-2.00	-2.00	2.00	-1.25	1.50	-1.75	1.50	-0.50	-2.00	1.50	1.00	0.50
Conventional Single Point Urban Interchange (SPUI)	**4.3**	-2.00	-1.00	2.00	-1.00	0.50	-2.00	2.00	0.00	-1.00	1.50	-1.00	0.00
Hybrid Diverging Diamond Interchange (hDDI)	**3.8**	-2.00	-2.00	2.00	-2.00	0.50	-1.50	1.50	-2.00	-0.50	1.50	1.50	-1.00
Split Diamond Interchange	**2.8**	-1.25	-1.50	0.00	-0.50	0.50	-1.00	2.00	-0.50	-0.50	1.00	1.00	0.00
Grade-Separation	**0.8**	-1.00	0.00	-1.00	0.00	1.00	-1.00	-0.50	1.00	-0.25	2.00	0.50	-1.50
Partial Diamond Interchange	**-1.8**	-2.00	-1.75	-0.50	-0.50	0.75	-1.50	0.50	-0.50	-0.50	1.50	1.00	0.50
Continuous Flow Intersection (CFI)	**-6.5**	-0.50	-0.50	0.50	-1.00	-2.00	-0.50	0.50	-2.00	0.00	0.50	-2.00	-1.50
Hybrid SPUI w/o On-ramps	**-10.0**	-1.50	-1.00	-2.00	-0.50	0.50	-1.00	-0.50	-0.50	-0.50	1.00	-1.00	0.50
No-Build Condition	**0.0**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Baseline = Existing Conditions	
Effect on Criteria	Rating
Much More / Much Better	2
More / Better	1
Same	0
Less / Worse	-1
Much Less / Much Worse	-2



Capital Cost

Preliminary engineering construction cost estimate based on historic bid data and quantities from a recent large corridor study in the Anchorage Bowl

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	Capital Cost: $50-60 Million A hybrid SPUI places the ramps on the inside of the mainline embankments and eliminates the need for braiding the ramps. The cost is still high because of the need for retaining walls, which will likely be necessary on both sides of each embankment.	-1.5
Half SPUI w/ CD Roads	Capital Cost: 60-70 million This is similar to the Split Diamond Interchange with the exception of that there is more work on the CD roads.	-1.5
Loop Ramp Interchange	Capital Cost: $50-55 Million Loop ramps on the north side will necessitate wider bridges (an extra lane for each one). More right-of-way will also be required in the northwest and northeast quadrant, with care not to impact the AWWU lift station. The cost of right-of-way here is somewhat uncertain and could raise the cost of this option.	-1.5
Half SPUI w/ Braided Ramps	Capital Cost: 90-100 million This is the most expensive option and would likely take place as a second phase to the Half SPUI w/CD roads. This option includes expensive bridges for the braiding as well as R/W near Tudor.	-2.0
Conventional Single Point Urban Interchange (SPUI)	Capital Cost: $90-100 Million Under the conventional SPUI, the classic tight diamond interchange with the ramp terminals brought in together would operate well given the signal spacing along 36th Avenue when compared to the flared diamond interchange arrangement (four close signals with the Old Seward Highway and LA Touché Street intersection). However, spacing to the Tudor Road interchange one-half mile to the south does not allow enough distance to make a weave with Tudor Road traffic. For the weave to operate safely and efficiently, braided ramps between the NB off-ramp to 36th Avenue and the NB on-ramp from Tudor Road – and conversely, the SB on-ramp and SB off-ramp, would be required. Therefore, a significant quantity of bridge structure and retaining walls would be necessary, which are the major cost items. Another concern would be the sanctuary impacts and wetlands mitigation.	-2.0

Interchange Design Name	Narrative	Rating
Hybrid Diverging Diamond Interchange (hDDI)	Capital Cost: $50-70 Million The hybrid DDI cost is comparable to the hybrid SPUI. Major cost items are the bridge structures and retaining walls for the raised prisms. Additionally the right-of-way and access restrictions along the Old Seward Highway will elevate the acquisition cost significantly.	-2.0
Split Diamond Interchange	Capital Cost: $40-45 Million The split diamond interchange between Tudor Road and 36th Avenue will require two signals on 36th Avenue and shorter bridges, similar to the partial diamond interchange, and one-way frontage road connections but no braided ramps between the two roadways.	-1.25
Grade-Separation	Capital Cost: $20-30 Million This interchange design is the most economical of all the options that will provide the greatest service to the through-traffic on the New Seward Highway. Major cost items are the bridge structure and retaining walls. This interchange design is an incomplete solution that will move congestion to adjacent intersections that are also currently over capacity. Future funding will be needed for improvements that will be necessary on the adjacent streets when the traffic moves to them. The capital costs of these improvements (on adjacent roadways) have not been estimated nor considered in this rating.	-1.0
Partial Diamond Interchange	Capital Cost: $ 80-90 Million The Partial Diamond Interchange will require two signals on 36th Avenue, but smaller mainline bridges when compared with the SPUI. Similar to the Conventional SPUI, spacing to the Tudor Road interchange one-half mile to the south does not allow enough distance to make a weave with Tudor Road traffic. For the weave to operate safely and efficiently, braided ramps between the NB off-ramp to 36th Avenue and the NB on-ramp from Tudor Road – and conversely, the SB on-ramp and SB off-ramp would be required. Therefore, a significant quantity of bridge structure and retaining walls would be necessary, which are the major cost items.	-2.0
Continuous Flow Intersection (CFI)	Capital Cost: $10-20 Million The least expensive interchange design of the twelve is improving the existing at-grade intersection by relocating the left-turns. Minimal right-of-way is required for this option, and bridge structures, large embankments, and retaining walls are eliminated. Major cost items will be median/island modifications, signal reconfiguration, and increasing paved area. The operational life expectancy of this improvement is 5 years based on projected growth rates so while the capital cost is low, the life cycle cost may be the highest of the options although that criteria was not considered in this rating.	-0.5

Interchange Design Name	Narrative	Rating
Hybrid SPUI w/o On-ramps	Capital Cost: $50-55 Million The removal of the interior on-ramps will be a minor savings in embankment and some retaining walls. There will be no change in the right-of-way, bridges, or signalization.	-1.5
No-Build Condition	Capital Cost: Minimal Operating Costs: ADT x Vehicle Operating Cost x minute of delay Essentially, there are no savings in allowing the existing condition to remain.	0

Impact to Private Property

Description of impacts to private properties adjacent to the intersection/interchange designs

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	Impacts at least three parcels in the SW quadrant of the interchange, one parcel in the NW quadrant, and three parcels in the NE quadrant. This option would consist of interior ramps and is similar to the conventional SPUI. Due to the interior ramps, the mainline is pushed closer to the western right-of-way line and any effects to view shed will be more pronounced. There is the potential for properties claiming noise impacts and damage to the view from their property.	-1.0
Half SPUI w/ CD Roads	This is similar to the hybrid SPUI. There is some minor impact along the CD roads; however, no additional right of way is anticipated over the hybrid SPUI. There would be changes to the access road behind the University Center Mall. There is the potential for properties claiming noise impacts and damage to the view from their property.	-1.0
Loop Ramp Interchange	Unique to this interchange design, three parcels in the NW quadrant will be required for the construction of the SB loop off-ramp. Additionally, one parcel in the NE quadrant will be required for the SB off-ramp and two parcels would be impacted in the NE quadrant for the SB ramp from 36th Avenue. This interchange design may also impact several in the SW quadrant of the interchange to make room for new turn lanes. There will be visual impacts associated with the bridges, as well as various retaining walls. There is the potential for properties claiming noise impacts and damage to the view from their property.	-2.0
Half SPUI w/ Braided Ramps	One business would be impacted in the SW quadrant. Additionally, right-of-way would need to be acquired from the parcel containing the Helen Louise McDowell Sanctuary, in the vicinity NE of the Tudor Road interchange. There is the potential for properties claiming noise impacts and damage to the view from their property.	-2.0
Conventional Single Point Urban Interchange (SPUI)	Impacts three parcels in the SW quadrant of the interchange make room for a new right-turn lane to the SB on-ramp. This is one of the more extensive options because the ramps will be woven and the limits of work will extend to the south to Tudor Road. There will be visual impacts associated with the braided ramp bridges, as well as various retaining walls. Additional right-of-way acquisition outside the core three properties are not expected at the interchange.	-1.0

Hybrid Diverging Diamond Interchange (hDDI)	In addition to the four parcels in the SW quadrant of the interchange, this interchange design would also impact the frontage along the parcel at the SE corner of 36th Avenue and Old Seward Highway. These impacts are due to a long right-turn lane for access to the southbound New Seward Highway. Additional significant costs and access impacts will be incurred due to restrictions along the Old Seward Highway between 36th Avenue and 34th Avenue (southbound off-ramp). There is the potential for properties claiming noise impacts and damage to the view from their property.	-2.0
Split Diamond Interchange	In addition to the three parcels in the SW quadrant of the interchange, this interchange design would also impact the restaurant in the northwest quadrant of the New Seward Highway as well as one parcel in the northeast quadrant to provide room for the ramps to and from the north. No additional right-of-way will be needed for the frontage roads, but there may be some concerns about limiting the access to one direction only. There is the potential for properties claiming noise impacts and damage to the view from their property.	-1.5
Grade-Separation	No right-of-way acquisition is needed. The grade-separation will fit within the limits of the existing right-of-way. Retaining walls will be required to accomplish this – particularly at the Best Western *Golden Lion Hotel*. Although this would not result in the direct acquisition of property, there is the potential for properties claiming noise impacts and damage to the view from their property. To minimize the walls in the northwest quadrant, property could be acquired for the slopes.	0
Partial Diamond Interchange	This interchange design also impacts three parcels in the SW quadrant of the interchange, to make room for a new right turn lane to the SB on-ramp. This is one of the more extensive options because the ramps to and from the south will be woven and the limits of work will extend to the south beyond Tudor Road. There may be some acquisition in the wetlands to the northeast of Tudor Road. There will be visual impacts due to the braided ramp bridges as well as various retaining walls.	-1.75
Continuous Flow Intersection (CFI)	This interchange design impacts three in the SW quadrant of the interchange. This option has the advantage of not obstructing the view shed greater that what exists today. There is the potential for properties claiming noise impacts and damage to the view from their property.	-0.5
Hybrid SPUI w/o On-ramps	Impacts three parcels in the SW quadrant of the interchange. This option would require the same separation, even for the interior two off-ramps. Due to the interior ramps, the mainline is pushed closer to the western right-of-way line and any effects to view shed will be more pronounced. There is the potential for properties claiming noise impacts and damage to the view from their property.	-1.0
No-Build	No additional property would be required.	0

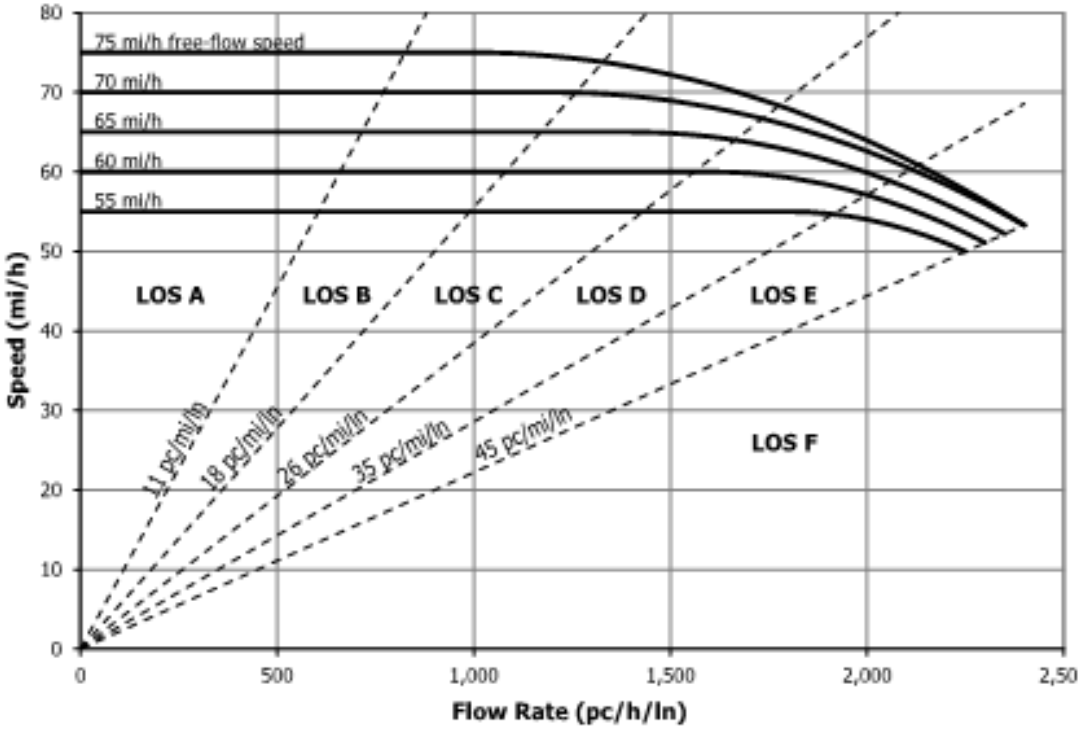
Traffic Operations

Expected operational advantages/disadvantages inherent with each of the traffic alternatives

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	The hybrid SPUI will operate with minimal delays in existing traffic conditions and would also operate with low delays under projected future traffic volumes, with or without the bottleneck at Benson Boulevard and Northern Lights Boulevard. The major impact to traffic may be the unusual conditions with the left-hand off- and on-ramps. Since this location is the primary access to the U-Med District, it will be used mostly by repeat commuters.	1.75
Half SPUI w/ CD Roads	This option works fairly well for the NSH/OSH/36th Avenue interchange area. The weave distances on the CD roads appear to be acceptable. This option, as is the case with most of these designs, does not improve conditions at the Northern Lights/Benson Couplet.	1.75
Loop Ramp Interchange	As with the partial diamond, this option will remove several conflicts at the New Seward Highway and 36th Avenue intersection. However, this option accommodates the high demand movements to the southern quadrants. This still may result in more congestion in those areas than there is under the existing configuration; however this is not expected to be great. The intersection at 36th Avenue and Old Seward Highway will also need careful attention on signal timing coordination with the adjacent intersections.	1.5
Half SPUI w/ Braided Ramps	This was one of the original options suggested earlier and not studied because of cost. However it works well at Tudor Road, and has one of the best overall traffic operations.	2.0
Conventional Single Point Urban Interchange (SPUI)	A conventional SPUI will operate with minimal delays in existing traffic conditions and will also function with low delays under future projected traffic volumes, with or without the bottleneck at Benson Boulevard and Northern Lights Boulevard. By accommodating all on and off movements to the New Seward Highway at 36th Avenue, adjacent intersections will be minimally affected.	2.0
Hybrid Diverging Diamond Interchange (hDDI)	The Hybrid DDI will operate with the least delay of all of the interchange designs in existing traffic conditions and would also operate with minimal delays under projected future traffic volumes, with or without the bottleneck at Benson Boulevard and Northern Lights Boulevard. By accommodating all on and off movements to the New Seward Highway at 36th Avenue, adjacent intersections will be minimally affected. The major impact to traffic may be the unusual operations of the intersection at 36th Avenue and the Old Seward Highway. Additionally, there will be sufficient access changes along both the Old Seward Highway and 36th Avenue.	2.0

Split Diamond Interchange	This option will allow access to all directions from both Tudor Road and 36th Avenue, but at the cost of sending several of the movements through two signalized intersections, thereby increasing the delay.	0.0
Grade-Separation	The grade-separation alternative will remove conflicts at the New Seward Highway and 36th Avenue intersection. Not accommodating any on or off movements to the New Seward Highway at 36th Avenue will divert traffic to already overcapacity intersections in the surrounding area, which will cause more congestion in those areas than there is under the existing configuration.	-1.0
Partial Diamond Interchange	The Partial Diamond interchange design will remove several conflicts at the New Seward Highway and 36th Avenue intersection. However, because it will not accommodate some of the movements, traffic will be diverted from 36th Avenue to already overcapacity adjacent street intersections in the surrounding area. This may result in more congestion in those areas than there is under the existing configuration.	-0.5
Continuous Flow Intersection (CFI)	The CFI will operate with adequate delays under existing volume conditions, but is close to capacity. This intersection design is estimated to operate at a Level of Service "F" under projected traffic volume conditions within five years.	0.5
Hybrid SPUI w/o On-ramps	This option would only allow traffic departing the New Seward Highway bound for 36th Avenue. This would certainly help the morning traffic but be of little help to the evening commuters, forcing them to other intersections that may already be at capacity. The concern necessitating the consideration of this option is that the slower on-ramp traffic will have a difficult time merging in with the high speed traffic using the typical taper on-ramp. A possible solution to this concern would be the installation of a parallel on-ramp that would be designed long enough to allow even the slowest moving traffic to accelerate up to speed and merge.	-2.0
No-Build Condition	This is the base case.	0

For explanation of Level of Service see chart below. Source: 2010 Highway Capacity Manual


75 mi/h free-flow speed
70 mi/h
65 mi/h
60 mi/h
55 mi/h
LOS A
LOS B
LOS C
LOS D
LOS E
LOS F
11 pc/mi/ln
18 pc/mi/ln
26 pc/mi/ln
35 pc/mi/ln
45 pc/mi/ln
Speed (mi/h)
Flow Rate (pc/h/ln)
0
10
20
30
40
50
60
70
80
500
1,000
1,500
2,000
2,50

Facility Maintenance

A comparison of the effort to maintain the new intersection/interchange, specifically during winter weather

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	Lane miles, bridges, and retaining wall maintenance would be similar to the Hybrid DDI interchange. The difficulty to plow would still exist but the interior ramps would allow considerably more snow storage between the NB and SB New Seward Highway. Retaining walls near the Best Western *Golden Lion Hotel* may prove difficult to plow without adversely affecting their parking lot, resulting in a long "push" rather than "throwing" over the wall.	-0.5
Half SPUI w/ CD Roads	This option would be similar at 36th Avenue to the Conventional SPUI with the addition of CD roads. While maintenance would be fairly straight forward, there would be the need to have the extra lane miles of the CD roads.	-0.5
Loop Ramp Interchange	The loop ramp option would probably have costs similar to the partial diamond interchange above, but instead of the braided ramp bridges, the overpass bridges would be one lane wider. The loops would increase the lane-mileage that would be required.	-0.5
Half SPUI w/ Braided Ramps	This option would have more bridges and retaining walls to maintain than any of the other options. The lengthy ramps would require a fair amount of maintenance as well.	-1.25
Conventional Single Point Urban Interchange (SPUI)	This interchange design would have the most lane miles. This option would also have the most bridges and retaining walls to accommodate the grade-separation and braided ramps. Snow storage may also be an issue because of reduced median and shoulder snow storage areas. We have also heard of complaints from equipment operators outside that they find both SPUI and Diverging Diamonds difficult to plow.	-1.0
Hybrid Diverging Diamond Interchange (hDDI)	This interchange design requires somewhat unconventional movements requiring channelization with signing, striping, and medians. Those movements will require a heightened need for maintaining signs and striping, and the medians will make plowing more difficult. Bridge maintenance requirements should be similar to the SPUI options. Lane miles to be maintained would be more than other options with the exception of the conventional SPUI. Plowing difficulties at the retaining wall adjacent to the Best Western *Golden Lion Hotel* parking lot will be a concern. Using interior ramps will allow more snow storage area.	-2.0
Split Diamond Interchange	The costs to maintain a split diamond interchange would be similar to the current interchange maintenance along the New Seward Highway, except that there would be two less ramps.	-0.5

Interchange Design Name	Narrative	Rating
Grade-Separation	This interchange design would result in the least change to highway maintenance. The New Seward Highway maintenance practice would be easier because the mainline of the highway could be plowed at speed without having to consider ramps or intersection plowing. The same would hold true for the highway maintenance of 36th Avenue. One signalized intersection would be removed along with electrical expenses. Additional costs would be incurred with the bridges and some retaining walls needed to accommodate the New Seward Highway over 36thAvenue. No additional lane miles would be added for the maintenance crews. Overall this is a maintenance-friendly design.	0
Partial Diamond Interchange	This interchange design would have lane miles, bridges and retaining walls similar to a conventional interchange, but without the plowing and snow storage issues listed above. The additional maintenance of two more bridges and retaining walls would have to be included into the overall M&O costs.	-0.5
Continuous Flow Intersection (CFI)	The CFI interchange design would eliminate any need for bridge or retaining wall maintenance, resulting in the least expensive option to maintain in regards to bridges or retaining walls. This option would require an increase in the number of signals as well as the complexity of the CFI lane configurations that would have to be maintained to a higher level because the configuration diverges from normal expectations. This will increase the effort required to maintain signs and striping, as well as the complexity in plowing.	-1.0
Hybrid SPUI w/o On-ramps	The maintenance concerns would be the same as the Hybrid SPUI except that there would be two less ramps to plow.	-0.5
No-Build Condition	There would be no change in the existing or planned maintenance at this intersection.	0

Pedestrians and Bicycles

In addition to motorists, the non-motorized traveling public are an important part of traffic through the intersection/interchange; comparison of the advantages/disadvantages for these modes described below

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	This interchange design will be similar to a typical four-legged intersection in terms of pedestrian and bicycle accommodation. A hybrid SPUI would have a slightly shorter crossing area than the conventional SPUI due to the ramp angle, but a larger crossing area than an at-grade intersection. Right-turns add another potential area of conflict.	1.0
Half SPUI w/ CD Roads	This is a fairly good option in that it allows uninterrupted pedestrian and bicycle traffic on the northern side of 36th Avenue.	1.5
Loop Ramp Interchange	This option reduces conflicts and improves safety for pedestrians and bicyclists by grade-separating the New Seward Highway traffic. The two intersections are more predictable for non-motorized traffic. The loop on ramp may cause issues with pedestrian crossings if it is designed to be a free-flow movement. The south side of 36th avenue would be conflict-free.	0.75
Half SPUI w/ Braided Ramps	This option has the same advantages of the half SPUI with CD roads. The north side of 36th Avenue would be conflict-free.	1.5
Conventional Single Point Urban Interchange (SPUI)	This alternative will be similar to a typical four-legged intersection in terms of pedestrian and bicycle accommodation. A conventional SPUI would have a slightly larger crossing area than the usual at-grade intersection. Right-turns add another potential area of conflict.	0.5
Hybrid Diverging Diamond Interchange (hDDI)	This interchange design creates short exposed crossing distances for pedestrians and bicyclists between refuges. Pedestrians experience fewer conflicting traffic streams than at conventional diamond interchanges. Due to signal phasing, pedestrian would cross the arterial in two stages, waiting in the center island between stages. Pedestrian movement between crossover points are preferred on sidewalks located within the median to avoid conflict with free flow left turn movements to entrance ramps from the arterial. Medians should be designed to accommodate sufficient pedestrian refuge space. Unfamiliar configuration may cause issues for pedestrians with visual impairments. If not designed properly, right turn channelization may encourage high-speed movements that present safety hazards for pedestrians. Crosswalk and sidewalk placement may not match alignments expected by pedestrians. Through-bicycle movements on the arterial have to merge across the free flow right turn diverge and merge movements.	0.5

Interchange Design Name	Narrative	Rating
Split Diamond Interchange	Similar to the other interchange designs, this one reduces conflicts and improves safety for pedestrians and bicyclists by grade-separating the New Seward Highway traffic. Intersections at the ramp terminals are consistent with other interchanges along the corridor and more predictable for non-motorized traffic.	0.5
Grade-Separation	This interchange design eliminates pedestrian and bicyclist conflicts with turning vehicles at the New Seward Highway.	1.0
Partial Diamond Interchange	Similar to the other interchange designs, this one reduces conflicts and improves safety for pedestrians and bicyclists by grade-separating the New Seward Highway traffic. Intersections at the ramp terminals are consistent with other interchanges along the corridor and more predictable for non-motorized traffic. The north side of 36th Avenue would be conflict-free.	0.75
Continuous Flow Intersection (CFI)	The CFI is a complex intersection that would likely be intimidating to non-motorized users. If the intersection is configured with pedestrian crosswalks to the outside of left turn lanes, yield rates to pedestrians may be low during the concurrent green phase, particularly if multiple left turn lanes are provided. If pedestrian crosswalks are located between left and through-lanes, pedestrians are placed between moving traffic on both sides, which can lead to safety hazards and make crossings particularly challenging for visually-impaired pedestrians. Wider medians are preferred to better accommodate pedestrians. If not designed properly and not signalized, right-turn channelization may encourage high speed movements that present safety hazards for pedestrians. Shorter cycle lengths reduce delay for pedestrians. Bicyclists can be accommodated in street or on off-street pathways that cross at pedestrian locations.	-2.0
Hybrid SPUI w/o On-ramps	This alternative will be similar to a typical four-legged intersection in terms of pedestrian and bicycle accommodation, but with shorter wait times due to the fact that there will be two less ramps to accommodate. This option would also have a slightly shorter crossing area due to the ramp angle. Right-turns add another potential area of conflict.	0.5
No-Build Condition	There will no changes in the current conditions; it will still be a long crossing of the New Seward Highway.	0

Maintenance of Traffic

During construction, established traffic patterns will be disrupted significantly. Each interchange design has unique impacts to these traffic patterns and potential impacts on adjacent intersections. Construction *will begin with a thorough public involvement campaign that would notify the public that there will be lane reductions on the New Seward Highway to two lanes in each direction during the building of the mainline embankment. The notification would recommend drivers use alternative routes whenever possible, thus hopefully reducing the overall through-traffic volumes.*

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east and west side retaining walls and embankment can be built, and then the bridge set (10-12-12-12-10). 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. With the initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. When traffic on the New Seward Highway has once again been reestablished, the signal on 36th Avenue may be removed and work may start lowering the grade on 36th Avenue and reconstructing the existing median. At the same time, the left-hand on- and off-ramps can be built connecting to the new signalized intersection in the middle. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two full construction seasons. When the time comes to make improvements at either Benson Boulevard/Northern Lights Boulevard or Tudor Road, an interchange at 36th Avenue will have continued utility in helping to maintain traffic during construction. A fully functional interchange at 36th Avenue will help to alleviate the pressure created by a partial or full shutdown of either of these two intersections during future construction.	-1.0
Half SPUI w/ CD Roads	This design will have some challenges in that the CD roads will need to be accounted for in the construction and will not be available for MOT unless the phasing for their construction is set later than the main line work.	-1.25

Interchange Design Name	Narrative	Rating
Loop Ramp Interchange	Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east side retaining walls, and the embankment (10-12-12-12-10) can be built. This may necessitate a temporary retaining wall on the west side to hold the embankment away from the traffic. With the setting of the bridge and initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. When traffic on the New Seward Highway has once again been reestablished, work may start lowering the grade on 36th Avenue, reconstructing the existing median, connecting the outboard ramps to the new ramp terminal intersection, and providing the new single signal. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two and a half to three full construction seasons.	-1.0
Half SPUI w/ Braided Ramps	This design has the same difficulties as the half SPUI w/ CD roads. Plus the bridges for the braided ramps will make the transitions of traffic at Tudor Road more difficult.	-1.75

Interchange Design Name	Narrative	Rating
Conventional Single Point Urban Interchange (SPUI)	Initial construction will begin with the realignment of the Tudor Road ramps on the north side of the interchange, and the embankment for the 36th Avenue south side ramps. The building of the braided bridge substructure will be completed under this phase also. Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east side retaining walls, and the embankment (10-12-12-12-10) and west side ramps can be built. This may necessitate a temporary retaining wall on the west side to hold the embankment away from the traffic. With the setting of the bridge and initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. When traffic on the New Seward Highway has once again been reestablished, work may start lowering the grade on 36th Avenue, reconstructing the existing median, connecting the outboard ramps to the new ramp terminal intersection, and providing the new single signal. Finally the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two and a half to three full construction seasons. When the time comes to make improvements at either Benson Boulevard/Northern Lights Boulevard or Tudor Road, an interchange at 36th Avenue will have continued utility in helping to maintain traffic during construction. A fully functional interchange at 36th Avenue will help to alleviate the pressure created by a partial or full shutdown of either of these two intersections during future construction.	-2.0

Interchange Design Name	Narrative	Rating
Hybrid Diverging Diamond Interchange (hDDI)	Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east and west side retaining walls and embankment can be built, and then the bridge set (10-12-12-12-10). 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. With the initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. When traffic on the New Seward Highway has once again been reestablished, work can begin on the complete reconstruction of 36th Avenue. In addition to lowering the grade, the complete urban street layout will change to provide for the east and westbound cross-over. Until the signals can be reinstalled on 36th Avenue, traffic will be limited to a single lane in each direction with STOP sign control. After the street cross-over is complete, the three interior ramps from the New Seward Highway can be built connecting to the new signalized intersection in the middle. About this time, 34th Avenue will be connected solely to 33rd Avenue via the Old Seward Highway, and the driveways along the Old Seward Highway between 36th Avenue and 34th Avenue will be removed allowing for the controlled-access southbound off-ramp to the Old Seward Highway at 36th Avenue. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two full construction seasons. When the time comes to make improvements at either Benson Boulevard/Northern Lights Boulevard or Tudor Road, an interchange at 36th Avenue will have continued utility in helping to maintain traffic during construction. A fully functional interchange at 36th Avenue will help to alleviate the pressure created in a partial or full shutdown of either of these two intersections during future construction.	-1.5

Interchange Design Name	Narrative	Rating
Split Diamond Interchange	Initial construction will begin with the realignment of the Tudor Road ramps on the north side of the interchange, towards 36th Avenue. The new ramps to the north of 36th Avenue will also be constructed. Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east side retaining walls, and the embankment (10-12-12-12-10) can be built. This may necessitate a temporary retaining wall on the west side to hold the embankment away from the traffic. With the setting of the bridge and initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. When traffic on the New Seward Highway has once again been reestablished, work may start lowering the grade on 36th Avenue, reconstructing the existing median, connecting the outboard ramps to the new ramp terminal intersection, and providing the new single signal. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two and a half to three full construction seasons.	-1.0

Interchange Design Name	Narrative	Rating
Grade-Separation	Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east side retaining walls and embankment can be built, and then the bridge set (10-12-12-12-10). This may necessitate a temporary retaining wall on the west side to hold the embankment away from the traffic. 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. With the initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. When traffic on the New Seward Highway has once again been reestablished, the signal on 36th Avenue may be removed and work may start lowering the grade on 36th Avenue, reconstructing the existing median, and providing final-lift paving on the whole project. The estimated duration of construction is two full construction seasons.	-1.0

Interchange Design Name	Narrative	Rating
Partial Diamond Interchange	Initial construction will begin with the realignment of the Tudor Road ramps on the north side of the interchange, and the embankment for the 36th Avenue south side ramps. The building of the braided bridge substructures will be completed under this phase also. Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east side retaining walls, and the embankment (10-12-12-12-10) and west side ramps can be built. This may necessitate a temporary retaining wall on the west side to hold the embankment away from the traffic. With the setting of the bridge and initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. When traffic on the New Seward Highway has once again been reestablished, work may start lowering the grade on 36th Avenue, reconstructing the existing median, connecting the outboard ramps to the new ramp terminal intersection, and providing the new single signal. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two and a half to three full construction seasons.	-1.5
Continuous Flow Intersection (CFI)	Most of the reconstruction necessary for this at-grade intersection is widening and median island modifications. Until the new signals can be installed, the cross-overs cannot be permitted and for a period of time there will be no turning movements allowed. The estimated duration of construction is one full construction season.	-0.5

Interchange Design Name	Narrative	Rating
Hybrid SPUI w/o On-ramps	Once the north and southbound left-turn pockets are removed and the northbound two lanes are moved over, the northbound east and west side retaining walls and embankment can be built, and then the bridge set (10-12-12-12-10). 36th Avenue will require a vehicle height limitation before the bridge is placed due to limited vertical clearance temporarily under the new structure. With the initial lift paving, the through-traffic may be moved up on the new embankment (3-11-11-2-2-2-11-11-3), and work can commence on the southbound embankment and bridge. When traffic on the New Seward Highway has once again been reestablished, the signal on 36th Avenue may be removed and work may start lowering the grade on 36th Avenue and reconstructing the existing median. At the same time, the left-hand off-ramps can be built connecting to the new signalized intersection in the middle. Finally, the contractor can provide the final-lift paving on the whole project. The estimated duration of construction is two full construction seasons.	-1.0
No-Build Condition	This is the base case.	0

Functional Life

Traffic volumes are projected to increase significantly within the projects lifetime. To better understand how each interchange design preforms over its lifetime, comparisons are made below.

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	The hybrid SPUI will function at an adequate LOS through the design year; however the surrounding network will fail and may queue back into the hSPUI if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersections. The left entrance and exit ramps are not expected to have a major negative impact on the functional life.	1.75
Half SPUI w/ CD Roads	This option will function at an adequate LOS through the design year; however, the surrounding network will fail if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersections, which would potentially cause gridlock-type conditions.	1.5
Loop Ramp Interchange	The loop ramp interchange with access to and from the south will still improve the overall traffic flow in the area. Some movements are not serviced, and that traffic flow will move to other already congested areas in the surrounding intersections. If other improvements were made to the surrounding intersections, this option would improve flow on 36th Avenue. The loop ramp, however, may impede traffic flow because of the weaving segments (CD lanes) with the Tudor Road ramps.	1.5
Half SPUI w/ Braided Ramps	This option will function at an adequate LOS through the design year; however, the surrounding network will fail if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersections, which would potentially cause gridlock-type conditions. The left entrance and exit ramps are not expected to have a major negative impact on the functional life.	1.5
Conventional Single Point Urban Interchange (SPUI)	The conventional SPUI will function at an adequate level of service (LOS) through the design year; however the surrounding network will fail and may queue back into the SPUI if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersections. The ramp braiding between the Tudor Road and 36th Avenue interchanges would allow for free flowing ramps and prevent weaving and improve capacity over all other options.	2.0
Hybrid Diverging Diamond Interchange (hDDI)	The hybrid DDI will function at an adequate LOS through the design year; however the surrounding network will fail if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersections, which would potentially cause gridlock-type conditions. The left entrance and exit ramps are not expected to have a major negative impact on the functional life.	1.5

Interchange Design Name	Narrative	Rating
Split Diamond Interchange	The split diamond of Tudor Road and 36th Avenue with access to and from the north will improve the overall traffic flow in the area, albeit with some delays due to having to transverse two signalized intersections.	2.0
Grade-Separation	The grade-separation will not improve the overall traffic flow in the area. If other improvements are made at surrounding intersections on the Seward Highway, then it will serve as a good connection and relieve east/west traffic.	-0.5
Partial Diamond Interchange	The partial diamond with access to and from the south will still improve the overall traffic flow in the area. Some movements are not serviced, and that traffic flow will move to other already congested areas in the surrounding intersections. If other improvements were made to the surrounding intersections, this option would improve flow on 36th Avenue.	0.5
Continuous Flow Intersection (CFI)	The CFI will not last much longer than the existing configuration. This option will begin to have failing operations (despite the metering effect of surrounding failing signals) before the year 2020 based on straight-line growth projections.	0.5
Hybrid SPUI w/o On-ramps	The hybrid SPUI will function at an adequate LOS through the design year; however with the removal of the two on-ramps, the surrounding network will fail and may queue back into the hSPUI if future improvements are not made at the Tudor Road and the Benson Boulevard and Northern Lights Boulevard intersections. The left exit ramps are not expected to have a major negative impact on the functional life.	-0.5
No-Build Condition	This is the base case.	0

Driver Expectancy

An FHWA report on the topic explains that "expectancy relates to a driver's readiness to respond to situations, events, and information in predictable and successful ways." Each interchange design is described and scored below according to how well motorists are expected to navigate through the new traffic patterns.

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	This option is a variation on the conventional SPUI, resulting from the insufficient spacing between Tudor Road and 36th Avenue, and 36th Avenue and Benson Boulevard. To avoid weaving conflicts between ramp and highway traffic, the interchange ramps at 36th Avenue are moved to the left side of the highway. Application of this atypical design is discouraged in most instances due to the potential for creating motorist confusion and is thus reserved for challenging urban situations where interchange spacing or other constraints limit possibilities. In this particular case, the anticipated users will be repeat traffic commuting to the U-Med District. Repeat diagrammatic signing should help relive the situation by adequately informing the driver. Examples of a similar interchanges can be found at the following locations: I-290 in Chicago, IL (41°52'25.16"N, 87°48'16.32"W) and (41°52'15.85"N, 87°46'27.56"W); I-244 in Tulsa, OK (36° 9'44.31"N, 95°53'12.32"W) and (36° 9'47.38"N, 95°54'16.42"W).	-0.5
Half SPUI w/ CD Roads	The utilization of a half SPUI may be somewhat difficult for the drivers to comprehend. In addition, the weave on the CD road will require a fairly quick movement at a slow speed. Drivers will also need to be aware of the earlier than expected exit ramp.	-0.5
Loop Ramp Interchange	The loop ramp interchange is consistent with other interchanges along the Seward and Glenn Highways. As such, driver expectancy should be better than some of the unconventional alternatives listed here. The main drawback is the lack of access to and from the north.	0
Half SPUI w/ Braided Ramps	This is similar to the Half SPUI w/ CD Roads with the exception that the weave on the CD road is eliminated. As above, drivers will also need to be aware of the earlier than expected exit ramp.	-0.5

Conventional Single Point Urban Interchange (SPUI)	Any motorist having driven the Alaska Highway System or the Interstate Highway in the Lower 48 will be familiar with the right-hand entrance and exit ramps identical to those used in a conventional diamond interchange. Instead of using two signals along the cross-street at either of the two ramp terminals in a classic diamond interchange, motorists driving a SPUI will pass through only one signalized intersection while using any of the four ramps. If constructed, this interchange would be a new experience for many motorists. With proper signalization, striping and signing, driving a SPUI is very intuitive and safe. Since the first SPUI opened in 1974, approximately 60 have been built throughout the Lower 48, including cold weather regions like Michigan.	0
Hybrid Diverging Diamond Interchange (hDDI)	The main feature of a hDDI that challenges a driver's expectancy is the crossover and brief travel on the opposite side of the roadway. Properly designed geometry, signing, and striping will ensure safety, but there is valid concern when these features are obscured by the arctic weather that is characteristic of Anchorage for at least half the year. The close proximity of the Old Seward Highway and 36th Avenue intersection further complicates the issue of driver expectancy. Drivers desiring to enter the SB freeway from EB 36th must travel in a dedicated lane in advance of the Old Seward Highway and 36th Avenue intersection, and proceed against a changing flow of eastbound and westbound traffic in the hDDI crossovers.	-2.0
Split Diamond Interchange	The split diamond interchange is generally consistent with other interchanges along the Seward and Glenn Highways, except that one may need to travel through another intersection before accessing the highway. As such, driver expectancy should be better than some of the unconventional interchange designs listed here. The main drawback is the lack of access to and from the north.	-0.5
Grade-Separation	Because this design lacks ramps or any other means of connecting traffic between 36th Avenue and the New Seward Highway, the only decision drivers are left with is whether their travel may require a connection through one of the two adjacent intersections at Benson Boulevard/Northern Lights Boulevard or the Tudor Road interchange. A simple grade-separation presents the least possibility for driver confusion at the intersection, but drivers who are accustomed to the present day access to 36th Avenue will have more confusion, and now need to find an alternative route for access.	1.0
Partial Diamond Interchange	The partial diamond interchange is consistent with other interchanges along the Seward and Glenn Highways. The main drawback is the lack of access to and from the north. As such, driver expectancy should be better than some of the unconventional interchange designs listed here. Also driver will need to aware of the earlier than expected exit ramp.	-0.5

Continuous Flow Intersection (CFI)	A CFI makes improvement on the delay time of a traditional at-grade intersection by displacing the left-hand turns where they can make their desired turn at the same time as through traffic. The only motorists who would expect something different from a traditional at-grade intersection are those turning left. Advanced signage would prepare drivers to use the left lanes to turn left. Upon reaching an advanced signal they would cross over oncoming traffic and await the signal phase timed with that of oncoming traffic to make their desired left turn.	-2.0
Hybrid SPUI w/o On-ramps	This option is a variation on the conventional SPUI, resulting from the insufficient spacing between Tudor Road and 36th Avenue and 36th Avenue and Benson Boulevard; the biggest change is the deletion of the two on-ramps. Application of this atypical design is discouraged in most instances due to the potential for creating motorist confusion and is thus reserved for challenging urban situations where interchange spacing or other constraints limit possibilities.	-0.5
No-Build Condition	This is the base case.	0

Environmental

Examples of environmental impacts include loss of wetlands, traffic noise, and obstructed view shed among others

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	This option would likely not affect wetlands or critical habitat. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.5
Half SPUI w/ CD Roads	If the right-of-way is not purchased for Phase II, then the environmental impacts will be significantly less. This partial interchange would affect an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-1.0
Loop Ramp Interchange	This option would likely not affect wetlands or critical habitat. This partial interchange would eliminate an area containing trees and vegetation in the NE quadrant. Potential noise and visual impacts may result from elevating the highway.	-0.75
Half SPUI w/ Braided Ramps	This option has the potential to affect wetlands to the southeast of the highway. This partial interchange would eliminate more of an area within DOT and PF right-of-way that has previously contained some landscaping improvements than the other interchange designs. Potential noise and visual impacts may result from elevating the highway. A portion of the Helen Louise McDowell Sanctuary would be impacted.	-2.0
Conventional Single Point Urban Interchange (SPUI)	This option has the potential to affect wetlands to the southeast end of the project. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-1.0
Hybrid Diverging Diamond Interchange (hDDI)	Environmental impacts are very similar to the Hybrid SPUI. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.5
Split Diamond Interchange	This option would likely not affect wetlands or critical habitat. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.5

Grade-Separation	This interchange design would not have an adverse affect on wetlands. This design would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.25
Partial Diamond Interchange	This option has the potential to affect wetlands to the southeast end of the project. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.5
Continuous Flow Intersection (CFI)	This would be very similar to the existing conditions. Air pollution, noise and wetland impact would not increase significantly. An area within DOT and PF right-of-way that has previously contained some landscaping improvements will be reduced.	0
Hybrid SPUI w/o On-ramps	As above, this option would likely not affect wetlands or critical habitat. Like the other interchanges this would eliminate an area within DOT and PF right-of-way that has previously contained some landscaping improvements. Potential noise and visual impacts may result from elevating the highway.	-0.5
No-Build Condition	This is the base case.	0

Safety

Safety should be an imperative criteria for any traffic facility. This comparison focuses mainly on the safety of motorists and includes crossing and merging conflict points at the interchange as well as the intersections of Old Seward Highway at 36th Avenue and at 34th Avenue. The Pedestrian and Bicycle criteria focuses on the safety associated with these modes.

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	The hybrid SPUI has the same number of conflict points as the conventional SPUI, with 38 total conflict points (24 crossing and 14 merging). Driver expectancy will be slightly lower than a typical SPUI or a diamond interchange. Having ramps on the left side is atypical, which may cause issues with merging. This option also does not have ramp braiding, which impacts the rating slightly when compared to the conventional SPUI.	1.0
Half SPUI w/ CD Roads	The half SPUI with CD roads has 44 conflict points (27 crossing and 17 merging) and retains the existing conflicts at Old Seward Highway and 34th Avenue. This option has similar safety components compared with the conventional SPUI but driver expectancy will be slightly lower than a typical SPUI or a diamond interchange. This option also does not have ramp braiding, which impacts the rating slightly when compared to the conventional SPUI. There are some additional weaving movements required on the frontage road.	1.5
Loop Ramp Interchange	The loop ramp interchange has 39 conflict points (26 crossing and 13 merging) but 36 of these are at the 36th Avenue and Old Seward Highway intersection. This configuration adds a 5th leg and has the highest number of conflict points of any single intersection. The loop ramp also presents a safety concern at the northern pedestrian crossing, as this is a free-flow movement.	1.0
Half SPUI w/ Braided Ramps	The half SPUI with braided ramps is the same as the half SPUI w/ CD roads and has 44 conflict points (27 crossing and 17 merging). This option has braided ramps that eliminate the weaving segments between 36th Avenue and Tudor Road.	1.5
Conventional Single Point Urban Interchange (SPUI)	A conventional SPUI has fewer conflict points than a typical intersection, and less than a typical diamond interchange. This option has 38 conflict points (24 crossing and 14 merging).The studies on the SPUI for safety have shown similar crash rates to a typical diamond; however, injury and fatality rates are lower than typical diamond interchanges.	1.5
Hybrid Diverging Diamond Interchange (hDDI)	The hDDI has 21 conflict points (10 crossing and 11 merging), by far the fewest number of conflict points of all of the interchange designs with full access. Statistics have shown that crash rates at DDIs are significantly lower than at diamond interchanges. The atypical design at Old Seward Highway could cause significant driver confusion if not properly signed and designed. This option does not have ramp braiding, and the left hand merging impacted the safety rating when compared to the other interchange types.	1.5

Split Diamond Interchange	The split diamond interchange has 42 conflict points (26 crossing and 16 merging). This option has more conflict points than a SPUI due to the fact that there are two ramp intersections instead of one. Traffic may also have to transit two signalized intersections to access the highway.	1.0
Grade-Separation	A grade-separation would improve safety on the 36th Avenue corridor by decreasing access and eliminating conflicts at Seward Highway. The downside is reduced access and redirection of traffic to other areas of midtown. This would also leave the Old Seward Highway and 36th Avenue intersection area as it is currently with 24 conflict points (16 crossing and 8 merging).	2.0
Partial Diamond Interchange	The partial diamond interchange includes a loop ramp in the northwest quadrant and shifts the southbound off-ramp to the 36th Avenue and Old Seward Highway intersection. This option has the fewest conflict points at 16 (9 crossing and 7 merging), but the configuration eliminates the northbound off-ramp and prohibits northbound traffic on Old Seward Highway north of 36th Avenue.	1.5
Continuous Flow Intersection (CFI)	The CFI has 46 conflict points (30 crossing and 16 merging) which is approximately the same number of conflict points at traditional intersections. The CFI may initially cause driver confusion, although the existing CFIs in the U.S. have not shown an increase in crash rates. In fact, the CFIs have shown a slight decrease in crashes over traditional intersections. The safety improvement over existing conditions would be due to a relief in traffic congestion.	0.5
Hybrid SPUI w/o On-ramps	This option has similar safety components compared with the conventional SPUI (number of conflict points, etc.). Driver expectancy will be slightly lower than a typical SPUI or a diamond interchange.	1.0
No-Build Condition	The No-Build condition is entirely at-grade and has 62 conflict points, 40 of which are the more dangerous crossing conflicts.	0

Long Range Plan

A rating of each interchange design's ability to meet the recommendations of the AMATS Long Range Transportation Plan. Currently the MTP provides for a grade-separation with access to/from the south.

Interchange Design Name	Narrative	Rating
Hybrid Single Point Urban Interchange (hSPUI)	The interior ramps work well for weaves and can be removed or added as needed to accommodate future plans. Access ultimately will be to all quadrants.	1.5
Half SPUI w/CD Roads	This does not allow movements to/from the north from 36th Avenue. However this appears to work fairly well with movements to the south of 36th Avenue. This option allows future improvements at the Northern Lights-Benson Boulevard couplet.	1.0
Loop Ramp Interchange	This option has many positives in that the highest demand moves needed in the future are accommodated. It is not likely that not having full ramp access will work as well in the long term. This in the interim works well even when the interchange to the north is added.	1.0
Half SPUI w/ Braided Ramps	This has similar benefits as the half SPUI w/ CD road. The braided ramps would accommodate more traffic than the CD roads.	1.0
Conventional Single Point Urban Interchange (SPUI)	This design does not work well with weave distances to possible future interchange at the Northern Lights and Benson Boulevard couplet. Access will be to/from the south. It is not likely that not having full ramp access will work as well in the long term.	-1.0
Hybrid Diverging Diamond Interchange (hDDI)	This option best meets future traffic demands with access to most quadrants.	1.5
Split Diamond Interchange	This has some positive effects with frontage type roads; however, it does not move the traffic as well in some conditions.	1.0
Grade-Separation	This works very well for the New Seward Highway, but poorly for access at 36th Avenue.	0.5

Partial Diamond Interchange	It is not likely that not having full ramp access will work as well in the long term.	1.0
Continuous Flow Intersection (CFI)	This type of at-grade intersection would be obsolete in less than ten years. It is not consistent with the MTP.	-2.0
Hybrid SPUI w/o On-ramps	This is a version of the hSPUI that takes out some of the movements; one that will definitely be needed.	-1.0
No-Build Condition	This is the base case.	0

Community and Government Expectations

A brief explanation of the community and government expectations as they relate to the project

Interchange Design Name	Narrative: Comments in this section are based on public meetings and meetings with stakeholders. This section also takes into account written comments from the public. Rating in this section will be scored after future public meetings	Rating
Hybrid Single Point Urban Interchange (hSPUI)	This option was the most popular with the business owners in particular and a large number of comments were received from that group. These generally pointed toward best continued access to businesses. This was not as popular with the pedestrian and bicycling communities. We heard very strongly that an access from 36th to NB Seward was preferred. This option can accommodate an eastbound 36th to north in the interim. Future ability to access all quadrants of an intersection is seen as positive. The fire and police departments had a slight preference for this option in that it had the possibility of various accesses to northern quadrants. They also stated that interior ramps should be little problem for the public once they were used to them. The more access that can be optioned at this interchange was seen as a positive in that less traffic would be diverted to other arterials or local streets. The ascetics of this would be somewhat worse that the half SPUI since the large retaining wall would be adjacent to adjoining properties rather than further back. Noise impacts were seen to be similar to the half SPUI and slightly better than the loop ramp option to businesses to the north.	1.50
Half SPUI w/ CD Roads	This option was the most popular with the pedestrian and bicycling public particularly if no NB access is added to this option. The local residents were very vocal in that they would like to see access from WB 36th to NB Seward at a minimum. NB access on this option would likely be temporary until the Northern Lights and Benson couplet interchange(s) are constructed. There were not adverse comments regarding this option other than the lack of various accesses to the north. Visual impact was important to local public. This was seen to be slightly better than the hybrid SPUI.	1.00
Loop Ramp Interchange	This option was presented to stakeholders at various meetings with feedback received from the public. The public saw this as a viable possibility but seemed less positive than the Hybrid or Half SPUI options. Loosing parking at BP and CH2M was seen as a possible down side of this option. The lack of ability or have interim north access was seen as a major problem by local public. The local public also though that lack on north access would drive traffic to local streets. This was seen to have similar visual impacts to the South and worse visual impact with the large ramps. Ped and Bicycle safety were seen as more a positive on these options since the south side of 36th would have less conflicts between ramps and pedestrians.	0.50
Half SPUI w/ Braided Ramps	Due to the fact that the braided ramps will not be pursued at this time the design concept it has not been specifically presented to the public or stakeholders at the last meeting. Any weight placed on this design for community and government expectations would be from previous meetings.	0.50
Conventional Single Point	This was not one of the options specifically presented to the public. Prior to the public meetings it was deemed to be not a good geometric fit for the site and	0.0

Urban Interchange (SPUI)	would not work well with weaves between interchanges to the north and south.	
Hybrid Diverging Diamond Interchange (hDDI)	The traffic flow of this option was seen as very positive. The general public questioned the how easy this would be to drive considering how the traffic moves across the opposing lanes. A drawback was that Old Seward was a source of some confusion with the DDI type of concept.	-1.0
Split Diamond Interchange	This was not one of the options specifically presented to the public. No great positive or negatives were heard regarding this type of interchange.	0.0
Grade-Separation	There was positive feed back in that this option would cause little disruption of businesses and properties. The negatives of this option dealt with no Seward highway Access from 36th. This was extremely unpopular with both the public and fire and police.	-1.5
Partial Diamond Interchange	This was not one of the options specifically presented to the public. In discussions of braided ramps needed for this concept there was some concern regarding access to some areas.	0.5
Continuous Flow Intersection (CFI)	The general attitude of the public and MOA was that a longer term solution should be looked at. This would be the case for any at grade intersection.	-1.5
Hybrid SPUI w/o On-ramps	The option would be seen as positive by the public for affect on businesses. However not having access to all quadrants was seen to be a drawback. This option was not shown at the last public/government meetings in July of 2014. On ramps were popular with all parties so this would show as not ideal.	0.5
No-Build	This is the base case.	0.0

Hybrid Single Point Urban Interchange (hSPUI)

N

BP Exploration

Ma James Y. & Lena

Northrim Bank

Alaska DOT

36th Ave

CH2M Hill

PR & F Joint venture

Alaska Car & Van Rentals

Best Western Golden Lion

Old Seward Hwy.

Coon Family Trust

Amvets Post Two

Kupreanof LLC

Seward Hwy.

Half SPUI with CD Roads

N

Old Seward Hwy.

Ma James Y. & Lena

BP Exploration

Northrim Bank

36th Ave

Alaska DOT

PR & F Joint Venture

Alaska Car & Van Rentals

CH2M Hill

Frontage Ramp. (SB)

Amvets Post Two

Best Western Golden Lion

Frontage Ramp. (NB)

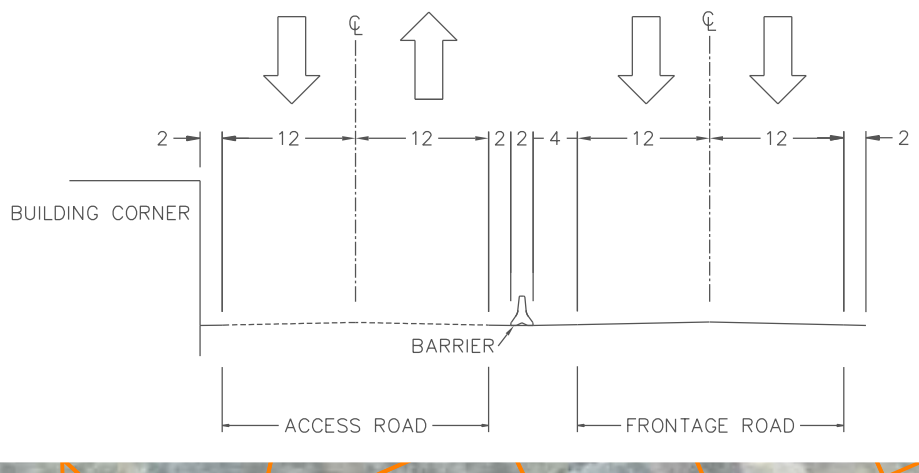
Kupreanof LLC

A

A

Existing Access Road

SECTION A–A



Half SPUI with CD Roads

N

Kupreanof LLC

University of Alaska

Hickel Investment CO

Frontage Ramp. (SB)

Frontage Ramp. (NB)

MOA Property

Tudor Rd

Loop Ramp Interchange

N

BP Exploration

Ma James Y. & Lena

Northrim Bank

Alaska DOT

CH2M Hill

36th Ave

PR & F Joint Venture

Alaska Car and Van Rentals

Best Western Goldern Lion

Old Seward Hwy.

Coon Family Trust

Amvets Post two

Seward Hwy.

Kupreanof LLC

Half SPUI with Braided Ramps

N

Old Seward Hwy.

Ma James Y. & Lena

BP Exploration

Northrim Bank

36th Ave

Alaska DOT

PR & F Joint venture

Alaska Car & Van Rentals

Coon Family Trust

Amvets Post Two

CH2M Hill

Best Western Golden Lion

Kupreanof LLC

Frontage Ramp. (SB)

Frontage Ramp. (NB)

Half SPUI with Braided Ramps

N

Kupreanof LLC

University of Alaska

Hickel Investment CO

Frontage Ramp. (SB)

Frontage Ramp. (NB)

MOA Property

Tudor Rd

Conventional Signle Point Urban Interchange (cSPUI)

N

BP Exploration

Ma James Y. & Lena

CH2M Hill

Northrim Bank

Alaska DOT

36th Ave

Old Seward Hwy.

PR & F Joint venture

Alaska Car & Van Rentals

Coon Family Trust

Amvets Post Two

Seward Hwy.

Best Western Golden Lion

Kupreanof LLC

Hybrid Diverging Diamond Interchange (hDDI)

N

BP Exploration

Ma James Y. & Lena

Northrim Bank

Alaska DOT

36th Ave

CH2M Hill

PR & F Joint venture

Alaska Car & Van Rentals

Best Western Golden Lion

Old Seward Hwy.

Seward Hwy.

Coon Family Trust

Amvets Post Two

Kupreanof LLC

Split Diamond Interchange

1 of 2

N

Seward Hwy.

36th Ave

Frontage Rd. (SB)

Frontage Rd. (NB)

Ma James Y. & Lena

Northrim Bank

Alaska DOT

BP Exploration

PR & F Joint venture

Alaska Car & Van Rentals

CH2M Hill

Coon Family Trust

Amvets Post Two

Best Western Golden Lion

Kupreanof LLC

Split Diamond Interchange

2 of 2

N

Kupreanof LLC

University of Alaska

Hickel Investment CO

MOA Property

Frontage Rd. (SB)

Frontage Rd. (NB)

Seward Hwy.

Tudor Rd

Grade Separation

N

BP Exploration

Ma James Y. & Lena

CH2M Hill

Northrim Bank

Alaska DOT

36th Ave

Old Seward Hwy.

Seward Hwy.

Alaska Car & Van Rentals

PR & F Joint venture

Coon Family Trust

Amvets Post Two

Best Western Golden Lion

Kupreanof LLC

Partial Diamond Interchange

N

BP Exploration

CH2M Hill

Ma James Y. & Lena

Northrim Bank

Alaska DOT

36th Ave

Alaska Car & Van Rentals

PR & F Joint venture

Coon Family Trust

Amvets Post Two

Best Western Golden Lion

Old Seward Hwy.

Seward Hwy.

Kupreanof LLC

Continuous Flow Intersection (CFI)

N

BP Exploration

Ma James Y. & Lena

Northrim Bank

Alaska DOT

36th Ave

CH2M Hill

PR & F Joint venture

Alaska Car & Van Rentals

Best Western Golden Lion

Old Seward Hwy.

Seward Hwy.

Coon Family Trust

Amvets Post Two

Kupreanof LLC

No Build Option

N

BP Exploration

Ma James Y. & Lena

Northrim Bank

Alaska DOT

36th Ave

CH2M Hill

PR & F Joint Venture

Alaska Car & Van Rentals

Old Seward Hwy.

Seward Hwy.

Best Western Golden Lion

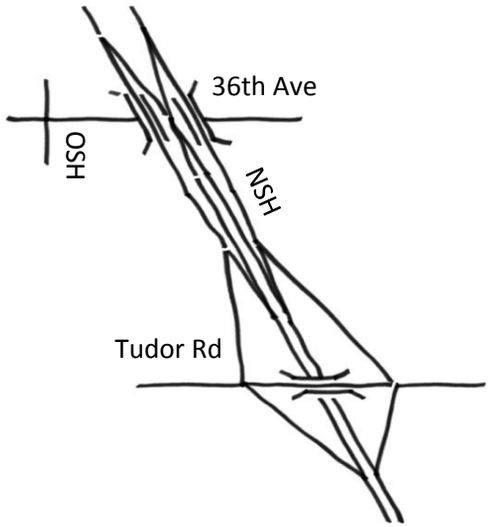
Coon Family Trust

Amvets Post Two

Kupreanof LLC

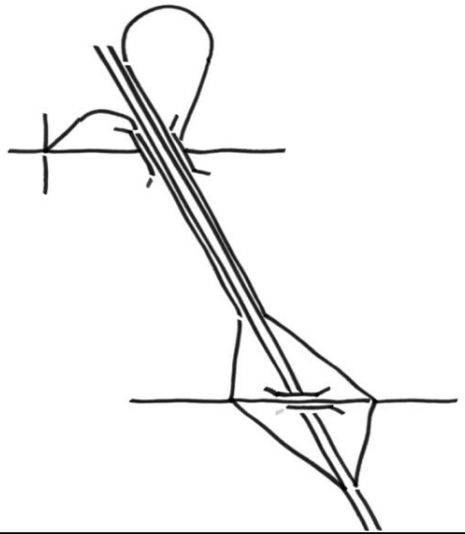
Options Carried Forward

Hybrid SPUI



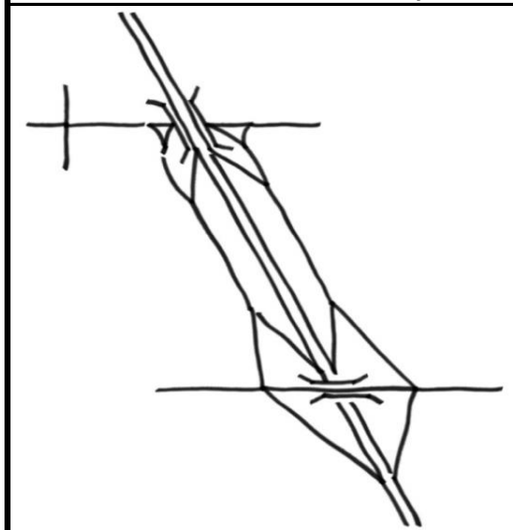
Description and Decision -The hybrid SPUI will operate with minimal delays in existing traffic conditions and would also operate with low delays under projected future traffic volumes. The left entrance and exit ramps are not expected to have a major negative impact on functionality. See Decision Matrix Narratives for additional information.

Loop Ramp



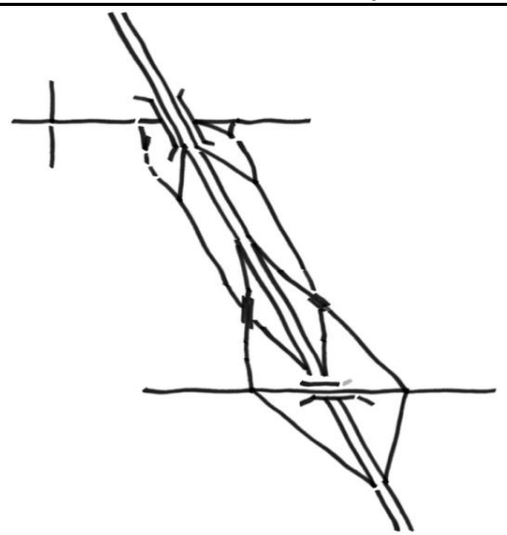
Description and Decision -This option accommodates the high demand movements to the southern quadrant and will still improve the overall traffic flow in the area. Some movements are not serviced with this option, and that northbound traffic flow will more to other areas in the surrounding intersections. See Decision Matrix Narratives for additional information.

Half SPUI with CD Roads



Description and Decision - This option will faction at an adequate LOS through the design year: however the surrounding network will be adversely affected if future improvements are not made at the Benson Boulevard and Northern Lights Boulevard intersection. The weave distance for this option on the CD roads appear to be acceptable. See Decision Matrix Narratives for additional information.

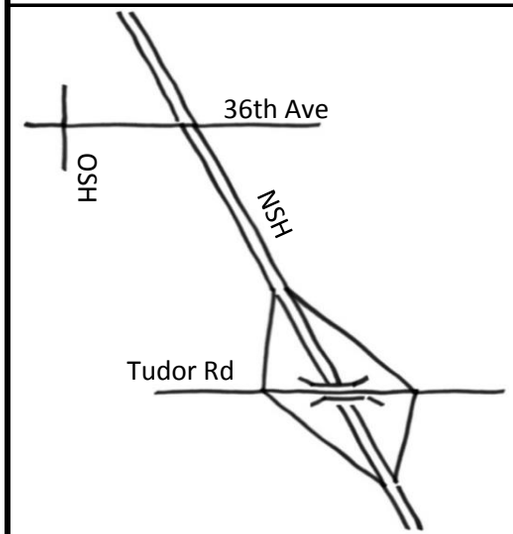
Half SPUI with Braided Ramps



Description and Decision - This option would be a possible future enhancement to the Half SPUI with CD Roads as it works well at Tudor Road, and has good overall traffic operations. See Decision Matrix Narratives for additional information.

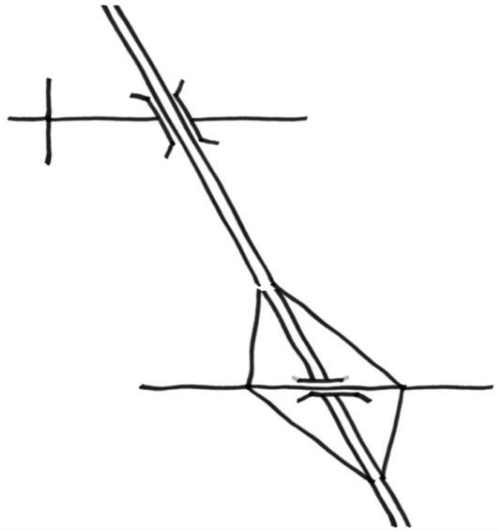
Options Considered, Not Carried Forward (1 of 4)

No Action Alternative/No Build



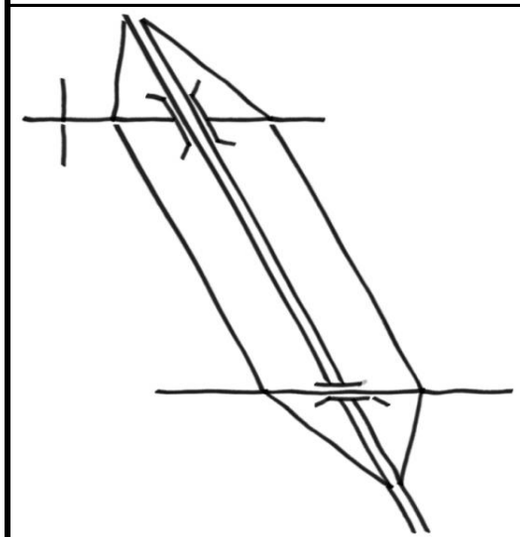
Description and Decision - This option does not meet the purpose and need to improve service levels and safety of the intersection.

Grade-separation



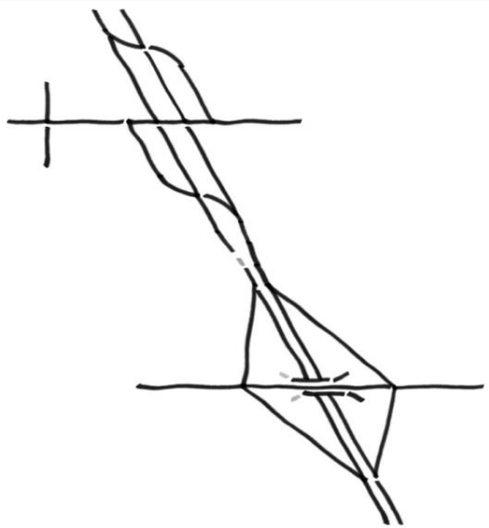
Description and Decision - This option was not carried forward since not offering access to the New Seward Highway (NSH) from 36th would cause near gridlock at intersections north and south of 36th Avenue. The Benson Boulevard-Northern Lights Boulevard Couplet is now running at level of service (LOS) F.

Split Diamond



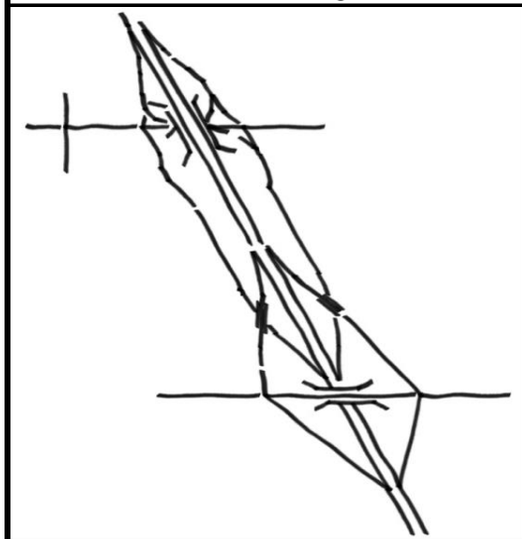
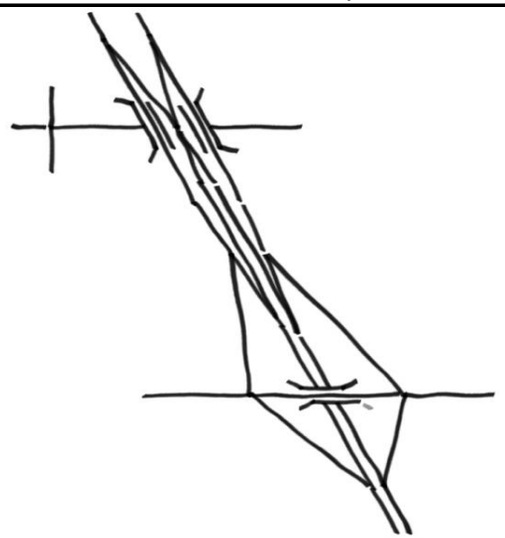
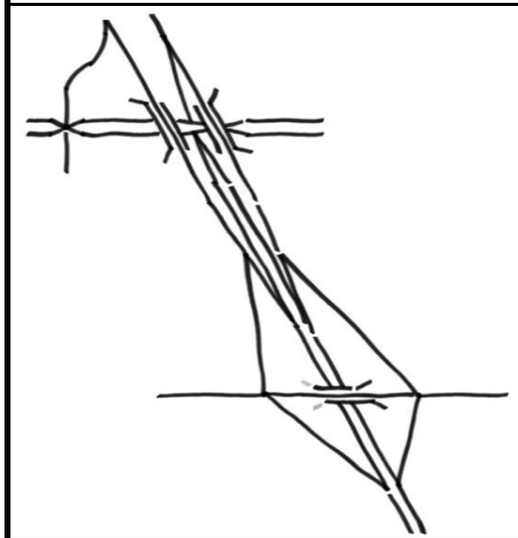
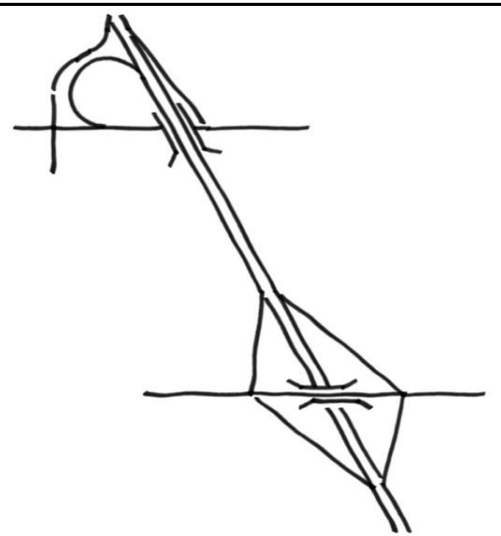
Description and Decision - Weave distances and lack of access points were problematic in this configuration. Increased traffic delays would occur, as some traffic movements would go through two signalized intersections, significantly lowering the LOS.

Continuous Flow Intersection

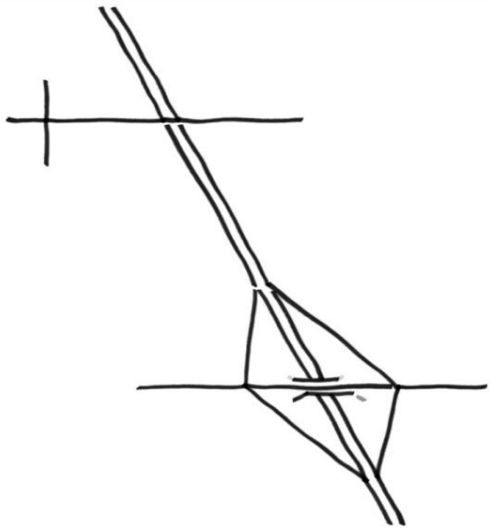
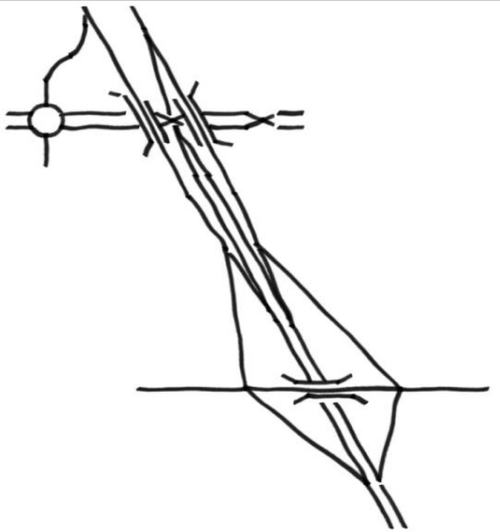
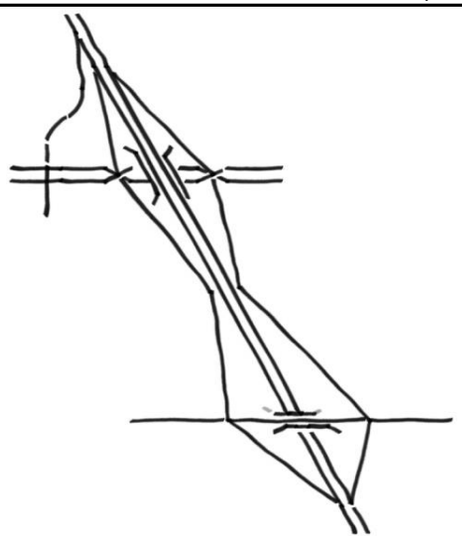
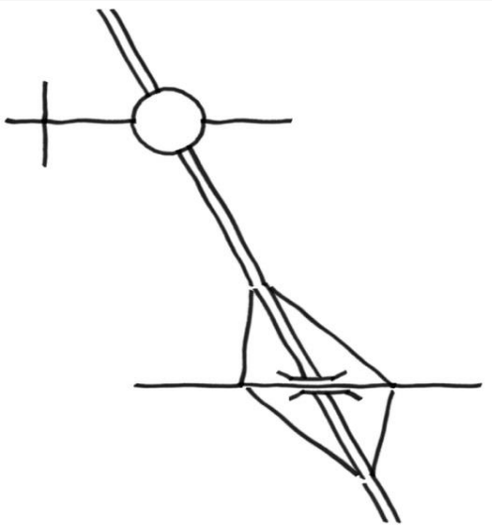


Description and Decision - While this option would work well for approximately 5 years it would likely have to be reconstructed with a graded separation of some type in the near future.

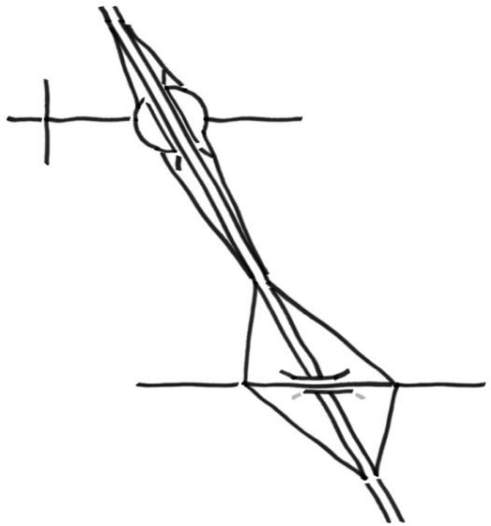
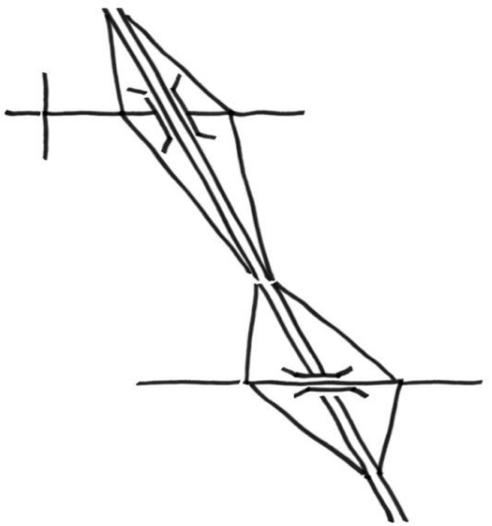
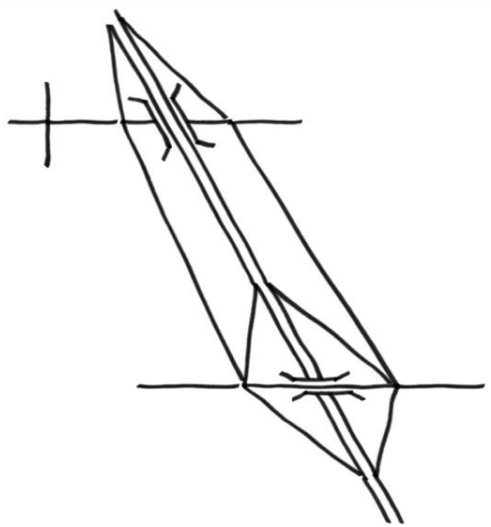
Options Considered, Not Carried Forward (2 of 4)

Single Point Urban Interchange (SPUI)		*Hybrid SPUI without On-ramps*	
	*Description and Decision -This option only functions if braided ramps are constructed to eliminate the issue of insufficient weave distance to the south of 36th Avenue. Taken as one single project it would result in one of the most expensive options.*		*Description and Decision - This option sought to systematically remove each of the ramps to see if costs could be reduced by subtracting unnecessary movements. The analysis showed that only the ramps to the north could be removed and still have the interchange function properly. However, great cost savings are not realized with the ramp removals.*
Hybrid Diverging Diamond Interchange (DDI)		*Partial Diamond Interchange*	
	*Description and Decision - This option poses serious challenges to the maintenance of traffic on 36th Avenue during construction. Maintaining striping visibility, which is key to a working DDI, would be nearly impossible during a typical Anchorage winter.*		*Description and Decision - This option fails to provide access to movements presenting high demand (e.g., NB off to 36th Avenue) and thus was not carried forward.*

Options Considered, Not Carried Forward (3 of 4)

Signal Optimization		*Diverging Diamond (DDI) with Roundabout*	
	*Description and Decision - This alternative did not meet the objective for improving the LOS on NSH or 36th Avenue. Modifications to signal timing is not believed to significantly minimize or redirect the traffic flow or volume. Reconfiguring signals may lead to additional delays at other area intersections leading to driver frustration.*		*Description and Decision - While this alternative optimizes LOS on 36th Avenue it reduces business access along 36th Avenue. The addition of the Old Seward Highway-36th Avenue roundabout wouldnot function well with the connections on the east legs of the DDI because the configuration of local streets would preclude some of the normal DDI ramp configuration. The option of changing traffic at AM and PM on 36th Avenue would likely not meet driver expectation.*
DDI (conventional)		*Roundabout or High Speed Traffic Circle*	
	*Description and Decision - This type of interchange would require three signals on 36th Avenue and would not have the proper spacing between the signals. There would also be insuf ficient weave distance to the north and south.*		*Description and Decision - This option was su ggested at public meetings. It was not pursued as it did not meet capacity needs and raised safety concerns due to insufficent space and anticipated traffic volumes.*

Options Considered, Not Carried Forward (4 of 4)

Roundabout Interchange		*Diamond Interchange*	
	*Description and Decision - This option was not pursued due to insufficient weave distance to the south and safety concerns related to traffic volumes and space constraints. Due to the proximity of nearby roadway intersections such as the Old Seward Highway/36th Avenue , there would be insufficient space for proposed travel patterns to function safely.*		*Description and Decision - This option would be similar to most of the other interchanges currently located along the New Seward Highway corridor; however, this option would result in insufficient weave distance to the south. This option was not carried forward because it does not provide adequate space for safe traffic movement.*
Split Diamond with additional On-Ramps (McP)			
	*Description and Decision - Connecting the eastside ramp terminals will be a one-way NB frontage road, and connecting the westside ramp terminals will be a one-way SB frontage road. At 36th Avenue, there will be a NB on-ramp, SB off-ramp, and SB on-ramp. At Tudor Road, there will a SB on-ramp, NB off-ramp, and NB on-ramp. This alternative was not taken forward due to the drawback is that there will be three signals on 36th Avenue -- and ramps to/from the north, which will preclude future expansion.*		

Appendix B

Ramp Need Analysis

AKSAS Project №: 54629

White Paper Memorandum

Date: 11/13/2013			**File:**			
Discipline: Reconnaissance Engineering			**RE: Seward & 36th Improvements, Ramp Need Analysis**			
To: Paul Witt Consultant Project Manager						
From: Steve Speth Traffic Engineer						
Routing/CC:	Mike Tooley	X	Chris Melander	X	Sean Holland	X

Purpose:	This memorandum documents the results of the Ramp Need Analysis performed for a modified single point urban interchange (SPUI) at the 36th Avenue interchange with Seward Highway. This paper is to examine the effect of eliminating each leg of an interchange.
Study Area:	New Seward Highway between Tudor Road and 36th Avenue
Assumptions:	Because this analysis is primarily the effect on the area transportation system rather than being focused on the intersection, the effect of eliminating one or more ramps would be similar regardless of the selected alternative for the intersection improvement.
Methodology:	Different variations of a single point interchange were evaluated in the VISSIM model using projected traffic volumes for the design year 2035. The model was derived from the Anchorage 2035 Metropolitan Traffic Plan with the existing configuration for the Seward Highway at Benson and Northern Lights intersections. The following configurations were analyzed: 1. Full modified single point interchange 2. Single point interchange with no northbound on-ramp 3. Single point interchange with no northbound off-ramp 4. Single point interchange with no southbound on-ramp 5. Single point interchange with no southbound off-ramp 6. Single point interchange with no on-ramps 7. Single point interchange with no northbound on-ramp / southbound off-ramp The volumes for these alternatives were re-routed based on the closest alternative route unless that route was already significantly over capacity. In those cases a

	nearby route with more capacity was selected as the most likely route. In some cases, the closest alternative route resulted in the movements being outside of the model area. This resulted in less volume and variations in the network performance volume totals as can be seen in Table 1.
Findings and Conclusions:	The tables below summarize results of the analysis. Each of the alternatives occupies a column and is compared to the base condition. The data represents output from the VISSIM model and the output of interest is shaded as: green represents a system wide improvement to traffic operations yellow represents similar operations red represents a negative impact. It is significant to note that the base condition represents a higher level of congestion than desirable in the design year (2035) (desired is a maximum latent demand of 8,000 vehicles).

	Base	No NB On	No SB On	No NB Off	No SB Off	No On Ramps	No NB On/SB Off
Average delay time per vehicle [s]	293	281	300	320	264	277	239
Total delay [h]	1842	1760	1795	1902	1648	1689	1525
Number of vehicles in the network	2623	2605	2505	2533	2271	2558	2188
Number of vehicles left in the network	19981	19926	19014	18856	20171	19363	20740
Latent delay [h]	1068	1014	1196	1239	1065	1144	1018
Latent demand	9082	8637	10339	10550	9014	9967	8439
Average Overall delay per vehicle [s]	463	443	500	529	435	485	399

Notes: Data is the average of 10 simulation runs from VISSIM 5.40.

Delay and level of service data was also collected and is summarized in Table 2. As can be seen in this memo, all the scenarios are have similar delay and level of service between alternatives with some minor improvements between some alternatives at different intersections.

	Base		No NB On		No SB On		No NB Off		No SB Off		No On Ramps		No NB On / SB Off	
Intersection	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
36th Seward	100	F	134	F	86	F	52	D	42	D	138	F	46	D
Benson Seward	105	F	96	F	102	F	146	F	111	F	97	F	98	F
Northern Lights Seward	128	F	123	F	135	F	142	F	126	F	131	F	121	F
36th Old Seward	102	F	83	F	57	E	46	D	37	D	95	F	30	C
Tudor NB	19	B	27	C	19	B	18	B	24	C	23	C	27	C
Tudor SB	72	E	73	E	107	F	74	E	87	F	85	F	86	F

Notes: Data is the average of 10 simulation runs from VISSIM 5.40.

Recommendations and Action Items:	Based on the sub-area VISSIM modeling, the ramps on the north side of 36th Avenue may be removed and still have similar or better overall operations in the system. This is mainly due to the removal of the friction these ramps cause in this area. The re-routed traffic that is added to the congested corridor may be better handled by removing some of this friction, despite being on overly congested corridors. Not having the connections also may function better with future build plans of an interchange or partial interchange north of 36th Avenue. It is not suggested to remove ramps on the south side of the 36th Avenue interchange, as removing those ramps would cause a large increase in system delay. Those ramps do not cause turbulence on the Seward Highway and improve connectivity and allow for better overall traffic flow in the study area.
References:	Anchorage 2035 Metropolitan Transportation Plan

Appendix C

Split Diamond Alternative

AKSAS Project №: 54629

White Paper Memorandum

Date: 12/05/2013			**File:**			
Discipline: Preliminary Engineering			**RE:** Seward Highway and 36th Avenue Interchange Split Diamond Interchange			
To: Paul Witt Consultant Project Manager						
From: Chris Melander Engineering Lead						
Routing/CC:	Mike Tooley	X	Steve Speth	X	Sean Holland	X
Purpose:	The purpose of this white paper is to evaluate the merits of a split diamond interchange between Tudor Road and 36th Avenue.					
Study Area:	Seward Highway corridor between Tudor Road and 36th Avenue					

Figure 1, *Study Area*

Assumptions: N/A

Methodology: The following is a summary of observations on the schematic design shown in Figure 2 below.

Positive attributes of a split diamond interchange include pedestrian experience, construction and maintenance costs, and environmental impacts.

Similar to the other interchange alternatives, this one reduces conflicts and improves safety for pedestrians and bicyclists by grade-separating the New Seward Highway traffic. Intersections at the ramp terminals are consistent with other interchanges along the corridor and more predictable for non-motorized traffic. The costs to construct and maintain a split diamond interchange would be similar to the current interchange maintenance along the New Seward Highway, except that there would be two less ramps.

Negative attributes of a split diamond interchange include ROW impacts, traffic delays, and an increase in conflict points, which is a safety concern.

In addition to the 3 parcels currently occupied by Alaska Car & Van Rentals, this alternative would also impact some of the CH2MHill parking in the northeast quadrant to provide room for the ramps to and from the north. No additional ROW will be

	needed for the frontage roads, but there may be some concerns about limiting the access to one direction only. This option will allow access to all directions from both Tudor Road and 36th Avenue, but at the cost of sending several of the movements through two signalized intersections, thereby increasing the delay. A Split Diamond Interchange has more conflict points than a SPUI due to the fact that there are two ramp intersections instead of one, and that traffic may have to transit two signalized intersections to access the highway -- less than a typical diamond interchange.
Findings and Conclusions:	Traffic analysis using the VISSIM micro-simulation model indicates that the split diamond would operate with more than 36% more delay per vehicle and would service approximately 20% less traffic during the future PM peak period than the modified full SPUI concept. This delay is caused because motorists desiring to access 36th Avenue or Tudor Road will be forced through an additional signal when compared with many of the other alternatives being considered. The increased traffic delay is expected to significantly lower the level of service and be deemed an inconvenience to the traveling public.  Figure 2, *Split Diamond Interchange*
Recommendations and Action Items:	This option is not recommend for construction.
References:	A Geometric Design of Highways and Streets, 6th Edition 2011, AASHTO

Appendix D

Modified Braided Ramps

AKSAS Project №: 54629

White Paper Memorandum

Date: 10/17/2013	**File:**
Discipline: Preliminary Engineering	**RE: Seward & 36th Improvements,** Braided Ramp Modification
To: Paul Witt Consultant Project Manager	
From: Chris Melander Engineering Lead	

Routing/CC:						
	Mike Tooley	X	Steve Speth	X	Sean Holland	X

Purpose:	The purpose of this white sheet is to evaluate geometric modifications to the original braided ramp concept in an attempt to decrease costs.
Study Area:	Adjacent to the New Seward Highway between Tudor Road and 36th Avenue  Figure 1, *Original braided ramp configuration*
Assumptions:	N/A
Methodology:	Used CAD to layout ramp geometry to investigate the possibility of significantly

	reducing bridge and wall quantities for the braided ramps in question.
Findings and Conclusions:	Consideration was given to moving the ramp braids from their location shown in Figure 1 to a point nearer to 36th Avenue, thinking that the lower speed of traffic on the southbound Seward on-ramp would allow for a more compact geometric configuration at their crossing. Upon beginning this exercise it became readily apparent that such a reconfiguration did not lend itself to a more efficient design. While the southbound on-ramp to the Seward Highway could be by turned more tightly based simply on design speed, the southbound off-ramp with which it is braided requires a straight and acute angle crossing to handle the high speed of vehicles leaving the highway. Thus bridge structure lengths were not significantly less than those designed nearer to Tudor Road. The close proximity to the University Mall also restricted the use of embankment fill slopes, thus necessitating the use of 4 triangular shaped retaining walls. Due to the flared ROW at the Tudor interchange, the original configuration only required 3 walls. While this configuration narrowly avoids impacts to the University Mall structures, it encroaches on their rear access road used for deliveries and shipping. Since similar constraints exist on the East side of the interchange this exercise was only performed on the West side to illustrate its shortcomings.  Figure 2, *Modified braided ramp configuration*
Recommendations and Action Items:	Since this exercise did not demonstrate an improvement on the original design for braided ramps at between Tudor Road and 36th Avenue it is recommended that the original design and cost estimate stand as the representative cost for such a solution.
References:	A Geometric Design of Highways and Streets, 6th Edition 2011, AASHTO